

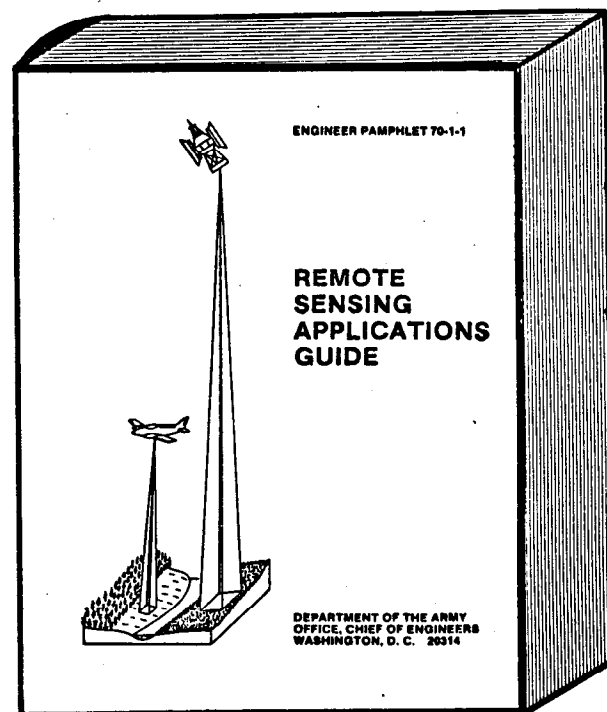
# Coastal Engineering Technical Note

## REMOTE SENSING APPLICATIONS GUIDE

PURPOSE: To explain what the "Remote Sensing Applications Guide" is, and how it can aid Corps field and laboratory offices in selecting the appropriate remote sensing techniques to support their mission. The "Guide" provides managerial and technical guidance for developing effective uses of remote sensing.

BACKGROUND: Since the 1930's, remote sensing has played an increasingly important role in the Corps of Engineers. Initially, aerial photography (see reference "CIDB," CETN-II-1) was used as a tool by Corps personnel involved in planning construction projects. More recently, advances have been made in the state-of-the-art of remote sensing technology, data processing, and analysis procedures. Concurrently, new and more complex data requirements have surfaced in the Corps to meet its expanding mission in such areas as regulatory programs, environmental impact assessment, evaluation of non-structural and flood-plain development alternatives, and coastal engineering. Modern remote sensing techniques are technically and operationally capable of meeting some of these data acquisition needs.

The "Remote Sensing Application Guide" was published in October 1979 as Engineer Pamphlet 70-1-1.



DEFINITION: Basically, remote sensing involves obtaining information on an object by a sensor without coming into direct contact with the particular object. Similarly, remote sensing technology is generally considered to include the acquisition and use of data about the earth from aircraft, balloons, rockets, and satellites. Thus, it represents a combination of aerospace technology, sensor technology, and all associated applications and data processing disciplines. This includes, for example, conventional low-altitude and high-altitude panchromatic, color, and color-infrared photography; Landsat (ERTS) and other civilian satellite data sources (such as Skylab; Seasat, Numbus, etc.); and side-looking radar (SLAR) and thermal imagery. Remote sensing also involves the satellite relay of technical information from ground sensors located in remote areas (commonly referred to as "data collection platform") to ground receiving stations for subsequent transmittal.

CONTENTS: The fundamentals of remote sensing and imagery equipment are contained in the "Guide" along with an extensive cross-referenced set of appendices identifying existing expertise, services, and past remote sensing work done by the Corps.

The "Guide" is organized in three parts as follows:

Part 1. Planning and Management Guidance

Part 2. Technical Guidance

Part 3. Supporting Appendices

a. Part 1. Planning and Management Guidance, has two functions. First, current Corps remote sensing activities are summarized from organizational, functional/disciplinary, and applications perspectives. This discussion is complemented by a comprehensive directory of remote sensing activities conducted at Corps division, district, and laboratory offices (Appendix D). Secondly, procedures are presented for assessing the technical feasibility of using remote sensing for a given data acquisition problem. Flow charts are provided for systematic execution of work plans. Pages 2-7 through 2-10 provide information on coastal engineering applications and references.

b. Part 2. This part provides a basic discussion of all technical aspects of remote sensing such as electromagnetic energy and its sources and interactions. Information is given on the effects of specific terrain materials on reflected and radiated electromagnetic energy and the effects of atmospheric conditions of the propagation of electromagnetic energy. The different types

of remote sensing systems available are listed and their basic methods of operation are discussed. A brief summary of the various platforms available for remote sensing is provided. Also, the types of products that result from conventional remote sensing systems are included. Information and guidance for planning remote sensing missions is discussed. Emphasis is on using the most cost-effective system that will provide the needed data in a form compatible with the user's capabilities for generating the final product. Guidance and supplemental information is given to help answer the questions: (1) What sensor should I use?, (2) When should I acquire the imagery?, (3) How should I fly the mission?

c. Part 3. This part comprises Appendices A through G.

(1) Appendix A provides a tabular summary of federal, state, and Corps of Engineers offices that have imagery available upon request. The tables include types of imagery, scales, products available, costs (when known), and appropriate addresses.

(2) Appendix B provides a tabular summary of federal civilian agencies and military units, state agencies, academic institutions, and private companies that have remote sensing data acquisition capabilities. The tables summarize the type aircraft and sensor systems available, costs (if available), and appropriate addresses.

(3) Appendix C is a tabulation of available remote sensors and their general characteristics. Tables are included for aircraft photographic systems, aircraft infrared scanners, aircraft multispectral scanners, aircraft side-looking airborne radar, spacecraft photographic systems, spacecraft infrared scanners, spacecraft multispectral scanners, spacecraft vidicon systems, available films, and costs of aerial film processing and reproduction.

(4) Appendix D is a user's directory for Corps of Engineers remote sensing applications. The directory is comprised of six sections which cover Corps of Engineers Remote Sensing Coordinators and Remote Sensing Committee members, indices of remote sensing data uses within the Corps, and a summary of remote sensing work ongoing at the Corps laboratories. Pages D-85 and D-86 describe coastal engineering applications by the Districts and Divisions, and pages D-109 and D-110 describe CERC's mission and remote sensing research activities.

(5) Appendix E is comprised of selected information and tools to assist in the planning and management of remote sensing programs. Blank preliminary and final work plans are provided along with guidelines for requesting or contracting remote sensing missions and a nomogram for predicting photographic system performance.

(6) Appendix F provides listings of image processing and interpretation services, image processing hardware systems, and image processing software systems.

(7) Appendix G is a listing of other sources of basic information on remote sensing.

AVAILABILITY: Copies of the "Remote Sensing Applications Guide", Engineering Pamphlet 70-1-1, can be ordered from the USACE Publications Depot, 890 South Picket Street, Alexandria, VA 22304 @ \$17.50 a copy, October 1979 edition, 820 pp. (Stock No. EP-70-1-1).

REFERENCE:

U.S. ARMY, CORPS OF ENGINEERS, COASTAL ENGINEERING RESEARCH CENTER, "Coastal Imagery Data Bank (CIDB)" CETN-II-1, Fort Belvoir, VA., 1980.